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Estimate of strength of anisotropic bars of arbitrary cross-section in the general case of their combined stress

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Abstract

We consider bars of arbitrary shape made of a homogeneous anisotropic material. In the general case, all six internal force factors (three forces and three moments) are simultaneously nonzero in the transverse cross-sections of the bar. We consider the case of small displacements and strains of the bar. Using the rigid-plastic model of a strained rigid body, the associated strain law, and the traditional hypotheses of static and kinematic character for the bars, we derive parametric equations for the limit surface (the strength surface) in the space of internal forces and moments acting in the the transverse cross-section. We present several versions of the obtained equations in specific cases (for orthotropy, transversal isotropy, and isotropy) and some numerical examples. © Allerton Press, Inc., 2010.

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Keywords

Anisotropy, Combined stress, Rigid-plastic model, Rods, Strength surfaces